An Roinn Oideachais
agus Scileanna

Junior Cycle Applied Technology

Contents

Introduction to junior cycle

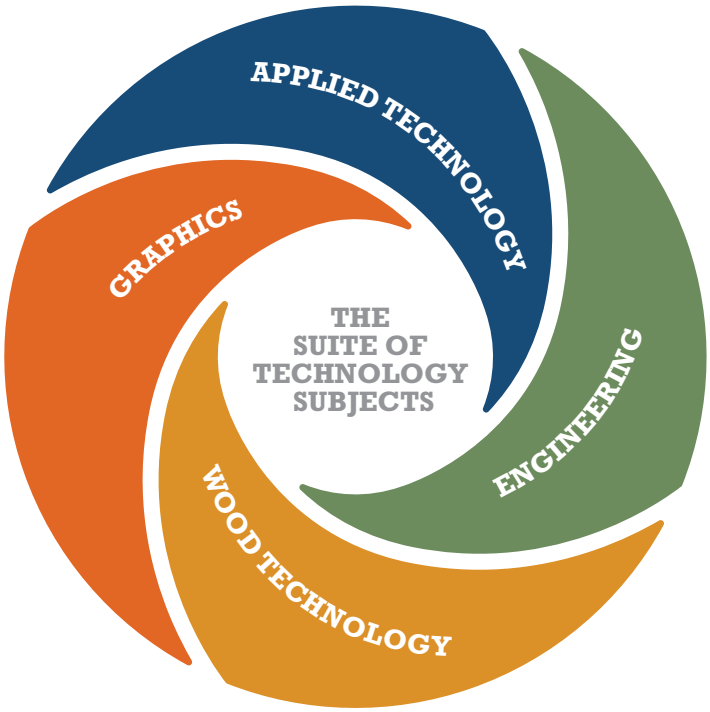
Junior cycle education places students at the centre of the educational experience, enabling them to actively participate in their communities and in society and to be resourceful and confident learners in all aspects and stages of their lives. Junior cycle is inclusive of all students and contributes to equality of opportunity, participation and outcome for all.

The junior cycle allows students to make a greater connection with learning by focusing on the quality of learning that takes place and by offering experiences that are engaging and enjoyable for them, and relevant to their lives. These experiences are of a high quality, contribute directly to the physical, mental and social wellbeing of learners, and where possible, provide opportunities for them to develop their abilities and talents in the areas of creativity, innovation and enterprise. The learner's junior cycle programme builds on their learning to date and actively supports their progress in learning and in addition, supports them in developing the learning skills that will assist them in meeting the challenges of life beyond school.

Preamble

Under the current *Framework for Junior Cycle*, students have access to a suite of technology subjects: Engineering, Wood Technology, Graphics and Applied Technology.

FIGURE 1: THE SUITE OF TECHNOLOGY SUBJECTS



Rationale

Each subject of the technology suite offers the student different experiences which contribute towards their education in technology education. As a result, preparing students for learning in the technology subjects is not just about teaching towards the technology but towards the skills that are fundamental to the technology subjects and are transferable into other areas of their learning. Skills that encourage the student to solve problems through creation, innovation, communication, collaboration and exploration, all of which are developed in an active learning environment where students can advance their ideas from conception to realisation.

Applied Technology addresses the modifications of the natural world made to fulfil human needs or desires. This subject offers students a lens through which to view the role and impact of technology within their classroom, their community and the world.

Every human-made product is designed by applying some knowledge of the natural world and is built using materials derived from the natural world, even when the materials are not themselves natural. New technologies can impact on society and the environment. Students will analyse expected benefits and impacts as they make decisions about their design solutions, while considering the end user, the environmental impact and the functionality of their designs.

Through the study of Applied Technology, students will have the opportunity to develop technological capability and literacy by engaging with a broad range of materials and systems. Students will develop an understanding of the principles of energy and control to resolve practical problems. Students will have the freedom to explore design and systems thinking through an iterative process to conceive, refine, realise and evaluate ideas.

Aim

The study of Applied Technology at junior cycle aims to:

- enable students to develop the necessary conceptual understanding, disciplinary skills and subject knowledge to investigate and solve real-life problems
- promote the enjoyment of the study of the subject while developing a curiosity about the technological world
- develop the ability of students to generate and evolve their ideas through an iterative process and communicate through appropriate media
- develop students' resilience through constructive critique and support their learning in a 'safe failure' environment
- encourage a disposition of enquiry, innovation, creativity, and self-efficacy.

Overview: Links

Applied Technology supports a broad range of learning at junior cycle. Tables 1 and 2 on the following pages show how junior cycle Applied Technology is linked to central features of learning and teaching in junior cycle.

TABLE 1: LINKS BETWEEN JUNIOR CYCLE APPLIED TECHNOLOGY AND THE STATEMENTS OF LEARNING

The statement	Examples of relevant learning
SOL 15: The student recognises the potential uses of mathematical knowledge, skills and understanding in all areas of learning.	Students will be able to apply numerical reasoning through marking out exercises from given dimensions.
SOL 19: The student values the role and contribution of science and technology to society, and their personal, social and global importance.	Students will evaluate the impact of technologies on their lives, society and the environment.
SOL 20: The student uses appropriate technologies in meeting a design challenge.	Students will determine the most suitable technologies available to them and apply them to fulfil the criteria of a given design challenge.
SOL 21: The student applies practical skills as she/he develops models and products using a variety of materials and technologies.	Students will create solutions through modelling and projects that encourage the development of their practical skills while working with a range of materials and equipment.
SOL 23: The student brings an idea from conception to realisation.	Students will individually develop a concept to address a problem and create a solution using appropriate materials and skills they have developed.
SOL 24: The student uses technology and digital media tools to learn, work and think collaboratively and creatively in a responsible and ethical manner.	Students will select appropriate digital media tools to research, explore and present design ideas.

Key skills

In addition to their specific content and knowledge, the subjects and short courses of junior cycle provide students with opportunities to develop a range of key skills. Figure 2 below illustrates the key skills of junior cycle. There are opportunities to support all key skills in this course but some are particularly significant.

FIGURE 2: JUNIOR CYCLE KEY SKILLS

TABLE 2: LINKS BETWEEN JUNIOR CYCLE APPLIED TECHNOLOGY AND KEY SKILLS

Key skill	Key skill element	Examples of student learning activities
Being creative	Exploring options and alternatives	Students will create design solutions to a problem/brief.
Being literate	Expressing ideas clearly and accurately	Students will select the most appropriate media to communicate their ideas/solutions.
Being numerate	Expressing ideas mathematically	Students will use correct mathematical notation and units when calculating forces.
Communicating	Using language	Students will demonstrate correct technical language when explaining a process.
Managing information and thinking	Thinking creatively and critically	Students will engage in innovative thinking to design a solution and critique their solution based on the needs of the problem.
Managing myself	Setting and achieving personal goals	Students will establish a plan of work and apply it to the creation of a project.
Staying well	Being responsible, safe and ethical in using digital technology	Students will work ethically and safely online and take responsibility for ensuring the security and privacy of themselves and others.
Working with others	Co-operating	Students will collaborate to research and develop solutions to a given problem.

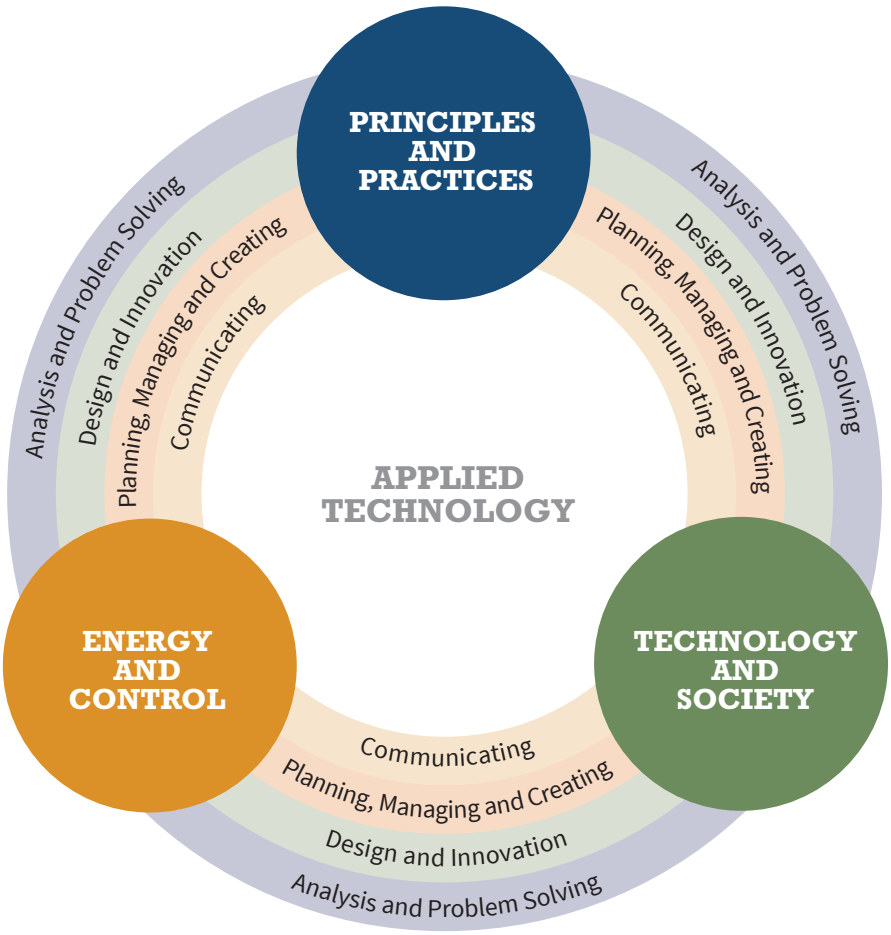
Overview: Course

The specification for junior cycle Applied Technology focuses on developing students' understanding of, and skills in, the application and impact of technologies in the world around them. This will be achieved through three inter-connected contextual strands: **Principles and practices**, **Energy and control** and **Technology and society**. Throughout each of the strands, the use of four elements: **Analysis and problem solving**, **Design and innovation**, **Planning, managing, creating** and **Communicating** creates a framework for learning that ensures a coherent learning experience for the students.

Applied Technology uses an interdisciplinary approach which encourages the integration of the three strands in the teaching and learning of the subject. It has been designed for a minimum of 200 hours of timetabled student engagement across the three years of junior cycle.

This specification aims to strike a balance between exploring the breadth of possibilities the study of the subject presents and providing opportunities for in-depth experiences of particular areas as appropriate. To this end, it allows for a certain amount of flexibility and freedom for teachers to facilitate learning in a way that reflects students' own choices, their curiosity and their creativity. The achievement of learning outcomes should be planned in a way that is active and stimulating.

FIGURE 3: THE STRANDS AND ELEMENTS OF JUNIOR CYCLE APPLIED TECHNOLOGY



Strands

STRAND 1: PRINCIPLES AND PRACTICES

In this strand, students will learn about and employ the fundamental principles and practices associated with the study of Applied Technology. Students will apply their knowledge of materials and equipment to create solutions that consider the end-user experience. The study of principles and practices facilitates the application of knowledge of existing and emerging technologies which will help students to decide the best means to creatively solve a real-world problem and realise a solution.

STRAND 2: ENERGY AND CONTROL

In this strand, students explore sources of energy which, when changed or controlled, enable devices to perform tasks safely and efficiently. Students are encouraged to recognise the need for economic and sustainable use of energy and materials.

Students will create controlled solutions using the skills, knowledge, values and attitudes developed through the study of the other strands.

STRAND 3: TECHNOLOGY AND SOCIETY

In this strand, students experience the interaction between technology and society. Students examine the environmental impacts of their design choices and consider user needs related to solutions. Students acquire a basic understanding of, and curiosity about, some of the issues which society faces as a result of technological developments and explore their potential use in society.

Elements

ELEMENT 1: ANALYSIS AND PROBLEM SOLVING

The learning outcomes in this element encourage students to investigate ideas and relationships that assist students in refining their solutions to problems. Students will learn to develop systematic approaches to analysis of problems that aid the development of solutions. This element encourages learning that is fundamental to Applied Technology and promotes the development of skills for lifelong learning.

ELEMENT 2: DESIGN AND INNOVATION

The learning outcomes in this element encourage students to 'think outside the box'. Students will have the opportunity not only to study the existing technologies relevant to the subject, but also to explore new and emerging developments. The design solutions developed by students will be influenced by their learning across the three strands.

ELEMENT 3: PLANNING, MANAGING, CREATING

The learning outcomes in this element encourage students to develop a range of project management skills while taking their designs to the creation stage. Students will develop the necessary skills needed to manipulate materials and select appropriate equipment in the realisation of solutions.

ELEMENT 4: COMMUNICATING

The learning outcomes in this element encourage students to select and use appropriate media to relay technical information, design ideas and learn about the impact technology has on the environment around them.

Progression from primary to senior cycle

PRIMARY CURRICULUM

While Applied Technology is not a stand-alone subject within the Primary School Curriculum, through its strands, elements and outcomes, junior cycle Applied Technology can progress related learning that has taken place at primary level.

A number of subjects and areas of the primary curriculum such as science, mathematics and Visual Arts make reference to the development of problem-solving skills which is a key skill for a student of Applied Technology. Throughout their years at primary school, students engage in various learning activities that develop their creativity. This development lends itself directly to the study of Applied Technology. Whether a student is working on a design project or creating a controlled system, they are engaging in learning activities that demand creativity.

SENIOR CYCLE

The study of Applied Technology at junior cycle develops the foundations for a student to continue their studies in the suite of technology subjects in both the Leaving Certificate and Leaving Certificate Applied programmes. With the addition of the study of relationships of inputs to outputs, students can also transfer learning from Applied Technology to the study of Computer Science.

More specifically, the subject Technology exists in both the Leaving Certificate and Leaving Certificate Applied programmes and the learning outcomes achieved in junior cycle Applied Technology establishes strong foundations for both these subjects.

The activities students engage in during junior cycle aim to develop a technologically-competent student who should be able to adapt to any discipline related to the technology subjects at senior cycle.

Expectations for students

Expectations for students is an umbrella term that links learning outcomes with annotated examples of student work in the subject specification. When teachers, students or parents looking at the online specification scroll through the learning outcomes, a link will sometimes be available to examples of work associated with a specific learning outcome or with a group of learning outcomes. The examples of student work will have been selected to illustrate expectations and will have been annotated by teachers. The examples will include work that is:

- exceptional
- above of expectations
- in line with expectations.

The purpose of the examples of student work is to show the extent to which the learning outcomes are being realised in actual cases.

Learning outcomes

Learning outcomes are statements that describe what knowledge, understanding, skills and values students should be able to demonstrate having studied Applied Technology in junior cycle. The learning outcomes set out in the following tables apply to all students. As set out here they represent outcomes for students at the end of their three years of study. **The specification stresses that the learning outcomes are for three years and therefore the learning outcomes focused on at a point in time will not have been 'completed' but will continue to support the students' learning of Applied Technology up to the end of junior cycle.**

The outcomes are numbered within each strand. The numbering is intended to support teacher planning in the first instance and does not imply any hierarchy of importance across the outcomes themselves. Junior cycle Applied Technology is offered at a common level. The examples of student work linked to learning outcomes will offer commentary and insights that support differentiation and inclusive classroom practices.

Strand 1. Principles and practices

BRIEF OVERVIEW OF STRAND

In this strand, students will learn about and employ the fundamental principles and practices associated with the study of Applied Technology. Students will apply their knowledge of materials and equipment to create solutions that consider the end-user experience.

The study of principles and practices facilitates the application of knowledge of existing and emerging technologies which will help students to decide the best means to creatively solve a real-world problem and realise a solution.

Elements	Learning outcomes *Students should be able to:*
Analysis and problem solving	1.1 develop a design solution drawing on experience and using evidence, reasoning, and decision making 1.2 analyse problems using a systematic approach 1.3 refine ideas through the use of prototyping 1.4 review planning decisions throughout
Design and innovation	1.5 consider the end-user experience at each stage of the design process 1.6 understand the role, impact and potential of existing and emerging technologies 1.7 apply innovative approaches in design solutions
Planning, managing, creating	1.8 develop a plan for the realisation of a solution 1.9 select appropriate materials, equipment and processes in solving a problem 1.10 execute a plan using appropriate tools, materials and processes 1.11 demonstrate adherence to recognised health and safety standards
Communicating	1.12 document progression from concept to realisation 1.13 communicate evidence of the iterative process of design

Strand 2: Energy and control

BRIEF OVERVIEW OF STRAND

In this strand, students explore sources of energy which, when changed or controlled, enable devices to perform tasks safely and efficiently. Students are encouraged to recognise the need for economic and sustainable use of energy and materials.

Students will create controlled solutions using the skills, knowledge, values and attitudes developed through the study of the other strands.

Elements	Learning outcomes *Students should be able to:*
Analysis and problem solving	2.1 investigate relationships between the inputs, transformations, and outputs occurring within simple control systems 2.2 evaluate ideas through the use of simulation[1]
Design and innovation	2.3 recognise the principles of control systems when developing their solution 2.4 design a logical sequence of instructions to control a device or system 2.5 apply innovative approaches to designing control system solutions
Planning, managing, creating	2.6 explore energy conservation and efficency 2.7 identify appropriate energy and control systems for design solutions 2.8 create control solutions to identified problems
Communicating	2.9 communicate technical information in appropriate forms 2.10 explain the transformation of inputs to outputs

1 Such as mechanical, electrical or digital modelling.

Strand 3: Technology and society

BRIEF OVERVIEW OF STRAND

In this strand, students experience the interaction between technology and society. Students examine the environmental impacts of their design choices and consider user needs related to solutions. Students acquire a basic understanding of, and curiosity about, some of the issues which society faces as a result of technological developments and explore their potential use in society.

Elements	Learning outcomes *Students should be able to:*
Analysis and problem solving	3.1 analyse the impact of constraints on the design of solutions 3.2 evaluate the effectiveness of solutions
Design and innovation	3.3 explain how human, societal and environmental considerations affect solutions and outcomes 3.4 explore applications of technology in local contexts
Planning, managing, creating	3.5 justify their selection of materials and processes based on factors such as environmental, economic and ethical considerations 3.6 consider user needs at all stages of design 3.7 recognise their responsibility for ensuring security and privacy of personal data
Communicating	3.8 evaluate the impact of technologies on their lives, society and the environment 3.9 discuss the potential of technology to affect society and the environment

Assessment and reporting

Assessment in education involves gathering, interpreting and using information about the processes and outcomes of learning. It takes different forms and can be used in a variety of ways, such as to record and report achievement, to determine appropriate routes for learners to take through a differentiated curriculum, or to identify specific areas of difficulty or strength for a given learner. While different techniques may be employed for formative, diagnostic and summative purposes, the focus of the assessment and reporting is on the improvement of student learning. To do this it must fully reflect the aim of the curriculum.

The junior cycle places a strong emphasis on assessment as part of the learning process. This requires a more varied approach to assessment, ensuring that the assessment method or methods chosen are fit for purpose, timely and relevant to the students. Assessment in junior cycle Applied Technology will optimise the opportunity for students to become reflective and active participants in their learning and for teachers to support this. This can be achieved through the provision of opportunities for students to negotiate success criteria against which the quality of their work can be judged by peer, self, and teacher assessment; and through the quality of the focused feedback they get in support of their learning.

Providing focused feedback to students on their learning is a critical component of high-quality assessment and a key factor in building students' capacity to manage their own learning and their motivation to stick with a complex task or problem. Assessment is most effective when it moves beyond marks and grades, and reporting focuses not just on how the student has done in the past but on the next steps for further learning. This approach will ensure that assessment takes place as close as possible to the point of learning. Final assessment still has an important role to play but is only one element of a broader approach to assessment.

Essentially, the purpose of assessment and reporting at this stage of education is to support learning. Parents/guardians should be given a comprehensive picture of student learning. Linking classroom assessment and other assessment with a new system of reporting that culminates in the awarding of the Junior Cycle Profile of Achievement (JCPA) will offer parents/guardians a clear and broad picture of their child's learning journey over the three years of junior cycle. To support this, teachers and schools have access to online assessment support material. Along with the guide to the Subject Learning and Assessment Review (SLAR) process, this focuses on learning, teaching and assessment support material, including:

- formative assessment
- planning for and designing assessment
- ongoing assessments for classroom use
- judging student work – looking at expectations for students and features of quality
- reporting to parents and students
- thinking about assessment: ideas, research and reflections
- a glossary.

The contents of the online support material include the range of assessment supports, advice and guidelines that enable schools and teachers to engage with the new assessment system and reporting arrangements in an informed way, with confidence and clarity.

Assessment for the JCPA

The assessment of Applied Technology for the purposes of the Junior Cycle Profile of Achievement (JCPA) will comprise:

- two Classroom-Based Assessments: Exploring the application of controlled systems in a local context, and Student self-analysis and evaluation
- a project
- a written examination.

CLASSROOM-BASED ASSESSMENTS

CBA 1: Exploring the application of controlled systems in a local context	The teacher's judgement is recorded for the purpose of subject learning and assessment review, and for the school's reporting to parents and students. The CBA will be completed within a three-week period during term two of second year.
CBA 2: Student self-analysis and evaluation	The teacher's judgement is recorded for the purpose of subject learning and assessment review, and for the school's reporting to parents and students. The CBA will be completed within a three-week period during term one of third year. This CBA will inform the student's work on the project.

FINAL ASSESSMENTS	WEIGHTING FOR EXAMINATIONS EXTERNALLY ASSESSED	
Project	70%	Will be specified and marked by the State Examinations Commission annually.
Written examination	30%	Set and marked by the State Examinations Commission.

Rationale for the Classroom-Based Assessments in Applied Technology

Classroom-Based Assessments are the occasions when the teacher assesses the students in the specific assessments that are set out in the specification. Classroom-Based Assessments are similar to the formative assessment that occurs every day in every class. However, in the case of the Classroom-Based Assessments, the teacher's judgement is recorded for the purpose of subject learning and assessment review, and for the school's reporting to parents and students.

Over the three years of junior cycle students will be provided with opportunities to stimulate their curiosity and interest in Applied Technology. The Classroom-Based Assessments link to the priorities for learning and teaching in Applied Technology. It is envisaged that through the Classroom-Based Assessments students will actively engage in practical and authentic learning experiences.

The Classroom-Based Assessments will provide an opportunity for students to:

- research information using a range of methods
- analyse data and evidence to make informed valued judgements and decisions
- organise information and plan logically
- communicate clearly and effectively
- collaborate with others on tasks
- communicate evidence of the iterative process of design and reflect on their learning.

Through these Classroom-Based Assessments students will develop their knowledge, understanding, skills and values, thereby achieving the learning outcomes across the strands.

Classroom-Based Assessment 1: Exploring the application of controlled systems in a local context

This is an investigation-based project that will provide students with the opportunity to individually or collaboratively explore the role of controlled systems in their local environment such as their classroom, school, community, etc. Throughout this assessment, students will develop the knowledge, understanding and skills associated with the Energy and control strand and the Technology and Society strand, which are fundamental to the study of Applied Technology.

Through this process, students will investigate either:

- an identified control system that provides a defined function

or

- a potential controlled system that could be introduced to provide a defined function.

It is important to instil in students a curious disposition where they are free to experiment, encouraged to explore new and challenging opportunities and to reflect on the process.

The findings of the students' investigation can be presented through any appropriate media[2].

2 Such as practical work, verbal, electronic, written and/or a combination.

Classroom-Based Assessment 2: Student Self-Analysis and Evaluation

For this Classroom-Based Assessment, the student, individually, will conduct an analysis of their coursework and skills to date in Applied Technology. Students will focus their analysis and evaluation on a range of completed tasks or on a specific task. Students are expected to critically review their progress and identify areas of strength and areas for improvement, with a view to informing their planning and decisions for the project. The formative assessment related to this process will be reported upon to the student and parent/guardian by the school as with all other Classroom-Based Assessments.

This Classroom-Based Assessment is designed to encourage the practice of self-evaluation throughout rather than only on completion of a task. Once the student conducts the self-analysis, they must interpret their analysis and evaluate their findings to offer constructive direction for the upcoming project.

The student can communicate the self-analysis and evaluation process through any appropriate media.

Assessing the Classroom-Based Assessments

More detailed information related to assessment of the Classroom-Based Assessments will be available in separate Assessment Guidelines. This will include, for example, the suggested length and formats for student pieces of work, the features of quality to be applied to the assessment, and support in using 'on balance' judgement in relation to the features of quality.

The assessment section of www.ncca.ie will also include substantial resource material for use and reference in ongoing classroom assessment of junior cycle Applied Technology, as well as examples of student work and guidance for the Subject Learning and Assessment Review process.

Features of quality

The features of quality support student and teacher judgement of the Classroom-Based Assessments and are the criteria that will be used by teachers to assess the pieces of student work. Features of quality for the Classroom-Based Assessments will be provided in the Assessment Guidelines document.

Project

On completion of the Classroom-Based Assessments, students undertake a project. The project is completed after the second Classroom-Based Assessment component in third year. The brief for the project is set and the project is marked by the State Examinations Commission.

Written examination

Students will undertake a written examination of 90 minutes' duration.

- The examination will take place at the end of third year and will be offered at a common level.
- The written examination will be set and marked by the State Examinations Commission.

Inclusive assessment practices

This specification allows for inclusive assessment practices whether as part of ongoing assessment or Classroom-Based Assessments. Where a school judges that a student has a specific physical or learning difficulty, reasonable accommodations may be put in place to remove, as far as possible, the impact of the disability on the student's performance in Classroom-Based Assessments. The accommodations, e.g. the support provided by a special needs assistant or the support of assistive technologies, should be in line with the arrangements the school has put in place to support the student's learning throughout the year.

Appendix A: Glossary of Applied Technology terms

This glossary is designed to clarify the terminology used in the junior cycle Applied Technology specification, enabling both teachers and students to understand how the terms are interpreted and applied.

Term	Interpretation
Iterative process	Iterative refers to student engagement with their resources to incrementally generate their designs through researching, modelling, prototyping and testing, for the refinement of ideas and solutions. At all stages, they will use new insights to improve and develop their product or process.
Prototypes	This is a rough model of the final product that a student can then refine and perfect before they create the final product. It is the first full-size, complete item of a product, which distinguishes it from a model where scale is arbitrary.
Simulations	The imitation of a situation or process through mechanical, electrical or digital modelling.
Solutions	A solution refers to a completed product or process. The solution integrates all the stages of the manufacture or design, starting with the early design stages, and ending with the finished product or process. The solution incorporates optimum ergonomics, efficiency and sustainability.

Appendix B: Glossary of action verbs

This glossary is designed to clarify the learning outcomes. Each action verb is described in terms of what the learner should be able to do once they have achieved the learning outcome. This glossary will be aligned with the command words used in the assessment.

Verb	Description
Analyse	study or examine something in detail, break down in order to bring out the essential elements or structure; identify parts and relationships, and to interpret information to reach conclusions
Apply	select and use information and/or knowledge and understanding to explain a given situation or real circumstances
Appreciate	recognise the meaning of, have a practical understanding of
Calculate	obtain a numerical answer showing the relevant stages in the working
Comment	give an opinion based on a given statement or result of a calculation
Communicate	use visual gestural, verbal or other signs to share meaning or exchange information; interaction between sender and recipient; both work together to understand
Compare	give an account of the similarities between two (or more) items or situations, referring to both (all) of them throughout
Consider	think carefully about something, typically before making a decision
Construct	develop information in a diagrammatic or logical form; not by factual recall but by analogy or by using and putting together information
Contrast	detect correspondences between two ideas
Convert	change to another form
Create	process and give form to the topic that is to be created using selected methods and material and/or to give the material used a new form
Define	give the precise meaning of a word, phrase, concept or physical quantity
Demonstrate	prove or make clear by reasoning or evidence, illustrating with examples or practical application
Describe	develop a detailed picture or image of, for example a structure or a process, using words or diagrams where appropriate; produce a plan, simulation or model
Design	planning the features of a solution that solves a perceived user problem
Determine	obtain the only possible answer by calculation, substituting measured or known values of other quantities into a standard formula

Verb	Description
Develop	advance a piece of work or an idea from an initial state to a more advanced state
Discuss	offer a considered, balanced review that includes a range of arguments, factors or hypotheses; opinions or conclusions are supported by appropriate evidence
Document	a piece of written, printed, or electronic matter that provides information or evidence
Draft	develop an idea or concept for planned work
Engage	enter into or become occupied by an activity or interest; to attract or hold interest and attention
Estimate	give a reasoned order of magnitude statement or calculation of a quantity
Evaluate (data)	collect and examine data to make judgements and appraisals; describe how evidence supports or does not support a conclusion in an inquiry or investigation; identify the limitations of data in conclusions; make judgements about the ideas, solutions or methods
Evaluate (ethical judgement)	collect and examine evidence to make judgements and appraisals; describe how evidence supports or does not support a judgement; identify the limitations of evidence in conclusions; make judgements about the ideas, solutions or methods
Execute	to carry out fully, to put completely into effect
Explain	give a detailed account including reasons or causes
Examine	consider an argument or concept in a way that uncovers the assumptions and interrelationships of the issue
Experience	to perceive an object on the basis of aesthetic considerations and to establish a direct personal relationship
Experiment	a procedure undertaken to make a discovery, test a hypothesis, or demonstrate a known fact
Evidence	provide information indicating if something is true, or valid or to establish facts in investigation
Explore	to think or talk about something in order to find out more about it
Identify	recognise patterns, facts, or details; provide an answer from a number of possibilities; recognise and state briefly a distinguishing fact or feature
Illustrate	use examples to describe something
Illustrate (graphically)	use drawings or examples to describe something
Investigate	observe, study, or make a detailed and systematic examination, to establish facts and reach new conclusions
Interpret	use knowledge and understanding to recognise trends and draw conclusions from given information

Verb	Description
Interpret (aesthetic)	assign meaning to objects on the basis of observations and contextual knowledge; translate the effect of an image into words by reasoning and explaining on the basis of reflection and understanding why the image is how it is and is not different
Justify	give valid reasons or evidence to support an answer or conclusion
List	provide a number of points, with no elaboration
Measure	quantify changes in systems by reading a measuring tool
Model	generate a mathematical representation (e.g., number, graph, equation, geometric figure) for real-world or mathematical objects, properties, actions, or relationships
Order	describe items/systems based on complexity and/or order
Outline	give the main points; restrict to essentials
Present	make objects perceivable for other
Prove	use a sequence of logical steps to obtain the required result in a formal way
Realise	implement, execute or put into practice an idea or a product or a draft
Recognise	identify facts, characteristics or concepts that are critical (relevant/ appropriate) to the understanding of a situation, event, process or phenomenon
Refine	make minor changes so as to improve or clarify
Respond	react to a stimulus which may be: critical emotional aesthetic or contextual based, or a combination of these
Represent	bringing clearly and distinctly to mind by use of description or imagination
Research	the study of materials and sources in order to establish facts and reach new conclusions; revision of accepted theories or laws in the light of new facts
Review	looking over or through material in order to correct, improve or revise
Sketch	represent by means of a diagram or graph (labelled as appropriate); the sketch should give a general idea of the required shape or relationship, and should include relevant features
Solve	find an answer through reasoning
Test	establish the quality, performance, or reliability of something
Understand	have and apply a well-organised body of knowledge
Use	apply knowledge or rules to put theory into practice; employ something in a targeted way
Verify	give evidence to support the truth of a statement
Visualise	make visible to the mind or imagination something that is abstract or not visible or present to the eye

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